https://doi.org/10.1590/1980-549720220008.supl.1

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Mortality trend and analysis of potential years of life lost due to leukemia and lymphoma in Brazil and Mato Grosso

Tendência de mortalidade e análise de anos potenciais de vida perdidos por leucemias e linfomas no Brasil e em Mato Grosso

Mariana Rosa Soares[I], Francine Nesello Melanda[I], Geraldo Soares de Lima Neto[II], Vitória Mayumi Takagi[II], Asaph Adler Souza dos Anjos[II], Liana Andreza Dias da Cunha[II], Guilherme Pinheiro da Silva[II], Beatriz Coelho dos Santos[II], Paulo César Fernandes de Souza[III,IV], Marcia Leopoldina Montanari Corrêa[I]

ABSTRACT: ***Objective*:** To estimate the mortality trend and to analyze the potential years of life lost (PYLL) due to leukemias and lymphomas in Brazil and Mato Grosso, from 2001 to 2019. ***Methods*:** Time-series study on deaths from leukemias and lymphomas with data obtained from the Mortality Information System. Trends were calculated by age group by the Joinpoint regression method, using calendar year as regressor variable, estimated annual percentage change (APC) and mean annual percentage change, considering 95% confidence intervals. PYLL rates were collected from the Cancer Mortality Atlas. ***Results*:** In Brazil, the mortality rate trend remained stable for both diseases in the period: leukemias (APC=0.2; 95%CI 0.0–0.3) and lymphomas (APC=0.2; 95%CI 0.4–0.1). In Mato Grosso state, the rate for leukemias was also stable (APC=0.3; 95%CI 1.0–1.6). For lymphomas, the trend was ascendant (APC=2.3; 95%CI 0.5–4.2), but descending among people younger than 59 years. For leukemias, PYLL rates were 64 and 65/100,000 in Brazil and Mato Grosso, respectively. For lymphomas, 27 and 22/100,000, respectively, with the highest rates found among males. ***Conclusion*:** The behavior of mortality rates from leukemia and lymphoma in Mato Grosso was different from that observed nationally, with an upward trend for lymphomas and no differences between age groups for both diseases. PYLL rates for leukemias were similar, while for lymphomas they were higher among men and lower in Mato Grosso when compared to Brazil.

***Keywords*:** Leukemia. Lymphoma. Trends. Potential years of life lost.

[I]Universidade Federal do Mato Grosso, Institute for Collective Health – Cuiabá (MT), Brazil.
[II]Universidade Federal do Mato Grosso, School of Health Sciences – Cuiabá (MT), Brazil.
[III]Universidade Federal de Mato Grosso, Postgraduate Program at the Institute for Collective Health – Cuiabá (MT), Brazil.
[IV]Mato Grosso State Health Department – Cuiabá (MT), Brazil.
Corresponding author: Mariana Rosa Soares. Avenida Fernando Corrêa, 2.367, Boa Esperança, CEP: 78060-900, Cuiabá (MT), Cuiabá. E-mail: enf.marianasoares@gmail.com

Conflict of interests: nothing to declare – **Financial support:** This study is part of the outreach project "Surveillance of Cancer and associated factors: updating of population-based and hospital records" with funding by the Mato Grosso State Health Department (SES-MT), from April 2016 to March 2021, and the research project "Cancer and associated factors: analysis of population-based and hospital records" with funding by the Public Labor Ministry of the 23rd Region, from July 2019 to July 2023.

RESUMO: ***Objetivos*:** Estimar a tendência de mortalidade e analisar os anos potenciais de vida perdidos (APVP) por leucemias e linfomas no Brasil e em Mato Grosso, entre os anos de 2001 e 2019. ***Métodos*:** Estudo de série temporal de óbitos por leucemias e linfomas obtidos do Sistema de Informação sobre Mortalidade. As tendências foram calculadas por faixa etária pelo método de regressão *joinpoint*, usando ano calendário como variável regressora, e estimaram-se a variação percentual anual (APC) e a variação percentual média anual, considerando intervalos de confiança de 95% (IC95%). As taxas de APVP foram coletadas do Atlas de Mortalidade por Câncer. Resultados: No Brasil, a tendência da taxa de mortalidade apresentou estabilidade para ambos os agravos, leucemias (APC=0,2; IC95% 0,0–0,3) e linfomas (APC=0,2; IC95% 0,4–0,1). No estado, a taxa por leucemias também apontou estabilidade (APC=0,3; IC95% 1,0–1,6). Para os linfomas, a tendência foi de aumento (APC=2,3; IC95% 0,5–4,2), contudo tendência decrescente foi observada entre aqueles com menos de 59 anos. Para leucemias, as taxas de APVP foram de 64 e 65/100 mil no Brasil e em Mato Grosso, respectivamente. Para linfomas, esses valores foram de 27 e 22/100 mil, respectivamente, sendo as maiores taxas encontradas no sexo masculino. ***Conclusão*:** As taxas de mortalidade por leucemias e linfomas em Mato Grosso apresentam comportamento diferente do observado nacionalmente, com tendência crescente para linfomas e sem diferenças entre as faixas etárias, para ambos os agravos. As taxas de APVP por leucemias foram semelhantes, no entanto para os linfomas foram maiores entre os homens e menores para o estado, quando comparadas com as do Brasil.

***Palavras-chave*:** Leucemia. Linfoma. Tendência. Anos potenciais de vida perdidos.

INTRODUCTION

Neoplasms are a topic of great interest in public health, given their incidence, mortality and complexities faced in the course of the disease. According the Global Cancer Observatory, more than 19.3 million new cases and approximately 10 million deaths from cancer were estimated for the year 2020, making the disease the leading cause of mortality in developed countries and the second in developing countries, a group of which Brazil is a part[1,2].

Leukemias form a group of more than 12 types of malignant neoplasms of white blood cells, the most common being acute lymphoblastic leukemia and acute myeloid leukemia, whose main characteristic is the accumulation of neoplastic cells in the bone marrow[3]. According to Globocan estimates, leukemia is the 15th most diagnosed neoplasm, accounting for 474,519 incident cases and 311,594 deaths[1]. In Brazil, according to the National Cancer Institute (INCA), approximately 5,920 new cases of leukemia in men and 4,890 in women were estimated for the triennium 2020–2022, representing a gross rate of 5.67 and 4.56 for every 100,000 men and women, respectively[4]. According to the Mortality Information System (SIM), in 2019 alone, 7,370 deaths from this cause were recorded[5].

Lymphomas are neoplasms that originate in the lymphatic system, the most common types being Hodgkin's and non-Hodgkin's lymphomas[6]. Worldwide, 544,352 new cases and 259,793 deaths were estimated for 2020[1]. Brazilian estimates of new cases of Hodgkin's and non-Hodgkin's lymphomas for the triennium 2020–2022 pointed to 14,670 new cases

among men and women of all age groups[4]. Furthermore, lymphomas were responsible for 4,713 deaths in Brazil in 2019[5].

In a study on the number of deaths in Brazil between 2010 and 2016, deaths from leukemias and lymphomas were found to occur predominantly among men and people of the white race/skin color. Older age (>60 years for leukemias and >70 years for lymphomas) was also found to be associated with higher mortality rates[7].

Risk factors for hematologic cancers are not well established, even though hereditary diseases, genetic mutations, epigenetic alterations, smoking, some viral infections and the presence of preexisting myelodysplastic syndromes seem to increase the risk of developing lymphomas and leukemias[8-10]. In addition, activities related to agriculture and consequent occupational, environmental or domestic exposure to chemical agents such as solvents and pesticides are likely to contribute to these malignancies[11,12].

Several studies also point to unequal behavior between regions of the country, which can be explained by disparities in access to health services, especially diagnosis and treatment, increased life expectancy and presence of agriculture and industries, especially in Mato Grosso[13,14].

This study is justified by the need to outline deaths from leukemias and lymphomas in the state of Mato Grosso, to understand the trend of mortality rates and potential years of life lost (YPLL) in comparison to the standard occurrence in Brazil; this can contribute to the creation of public policies, the promotion of preventive measures and actions to increase the survival of individuals affected by these health problems.

Thus, the objectives of this study were to estimate the mortality trend and to analyze the PYLL related to leukemias and lymphomas in Brazil and Mato Grosso, between 2001 and 2019.

METHODS

This is an ecological time series study on mortality rates from leukemias and lymphomas, using data from deaths of individuals of all ages that occurred in the state of Mato Grosso between 2001 and 2019. It belongs to a larger project called "Cancer surveillance and associated factors: update of population-based and hospital records", carried out in partnership with the Health Department of the State of Mato Grosso, the Public Ministry of Labor of the 23rd Region of Mato Grosso, and Universidade Federal de Mato Grosso.

The state of Mato Grosso is located in the Midwest region of the country, has an area of 903,207,050 km^2 and is made up of 141 municipalities. With an estimated population of 3,567,234 inhabitants in 2021, the state has a human development index (HDI) of 0.725, ranking 11th among Brazilian states[15].

For sociodemographic information related to deaths from leukemias and lymphomas, the SIM platform was consulted and the following codes were considered for the underlying

cause, according to the 10th edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-10):

- C81: Hodgkin's lymphomas;
- C82: non-Hodgkin lymphomas, follicular (nodular);
- C83: diffuse non-Hodgkin lymphomas;
- C84: cutaneous and peripheral T-cell lymphomas;
- C85: non-Hodgkin lymphomas of other and unspecified types;
- C91: lymphoid leukemias;
- C92: myeloid leukemias;
- C93: monocytic leukemias;
- C94: other type-specified leukemias;
- C95: leukemia of unspecified cell type.

The number of deaths and proportional mortality were described according to variables sex, race/color, educational level, marital status, and age group. Crude and adjusted mortality rates were calculated for each year of analysis, dividing the number of cancer deaths (leukemias or lymphomas) by the population over the period. The standardized rates were calculated by age using the direct method, based on the world population proposed by Segi, reviewed by Doll and Smith[16].

To analyze trends in mortality rates, the joinpoint regression method was used, with the calendar year as regression variable. The objective of the analysis was to identify the occurrence of possible joinpoints where there was a significant change in trend.

The method identified joinpoints based on the model with maximum three change points. The final model selected was the most adjusted, with annual percentage change (APC) based on the trend of each segment, estimating whether these values were statistically significant at the 95% confidence level. The program's default option was chosen for fitting a model of uncorrelated errors, after tests for the presence of serial autocorrelation indicated that the analysis was safe against misinterpretation. The significance tests used were based on the Monte Carlo permutation procedure and on the calculation of the APC in ratio, using the ratio logarithm.

To quantify the summary measure of trend over the period, the average annual percentage change (AAPC) was calculated, that is, a summary measure of APCs calculated based on the weighted average of angular coefficients of the linear regression model with weights equal to the length of each segment within the time frame. In the description, the terms "increase" or "decrease or drop" mean that the trend is statistically significant ($p<0.05$). For non-significant ones, the term "stable"[17,18] was used. The variable age group was recategorized into: 0 to 19 years old, 20 to 59 years old, 60 years and older, considering cases of children, adults and elderly people.

PYLL rates, calculated using the Cancer Mortality Atlas, available on the INCA/Ministry of Health tabulator electronic page, were consulted[19]. To tabulate this indicator, deaths that occurred in individuals aged less than one year old were excluded, as well as those over

70 years of age, according to the method proposed by Romeder and McWhinnie[20] regarding upper age limit. The tabulator then adds the number of deaths in each age group and multiplies them by the years of life remaining until age 70. Thus, the PYLL translates the magnitude of mortality, as it considers not only the risk of dying, but the age at which death occurred, showing the importance of premature mortality as an expression of the social value of death[20].

Data were described as absolute and relative measures using the Excel® 2010 software (Microsoft Corporation, United States), while trend analyses were performed in the Joinpoint Regression software, version 8.3.6.1.

This study was submitted to the Research Ethics Committee of Hospital Universitário Júlio Müller and approved with the Certificate of Presentation of Ethical Appreciation (CAAE) 98150718.1.0000.8124, opinion number 3.048.183, dating from November 20, 2018; and to the Research Ethics Committee of Mato Grosso State Health Department, approved with CAAE 98150718.1.3003.5164, opinion number 3,263,744, dating from April 12, 2019.

RESULTS

Between 2001 and 2019, 1,468 deaths from leukemias and 724 deaths from lymphomas were recorded in individuals residing in the state of Mato Grosso. When observing the distribution according to ICD-10 categories, among, the most frequent types of leukemia leading to death were myeloid (41.1%) and lymphoid (31.1%). As for deaths from lymphomas, non-Hodgkin's lymphomas of other types and unspecified types (83.4%) were the most common ones, followed by diffuse non-Hodgkin's lymphomas (11.3%).

For both neoplasms, proportional mortality was higher in males (54 and 62.4%, respectively). Of deaths from leukemias, most individuals were of mixed race/skin color (56.2%), with four to seven years of education (26.2%), married (41.1%), followed by single (36.1%), and under the age of 19 (20.6%). Regarding lymphomas, most individuals were brown or black (55.9%) and married (50.8%), although differences were observed in the level of education and age: the highest proportion of deaths occurred among those with one to three years of schooling (27.2%) and the aged between 60 and 69 years (22.5%), followed by the aged between 70 and 79 years (20.9%) (Table 1). About 10% of the records did not bring information about level of education and marital status.

Standardized leukemia mortality rates in Brazil ranged from 2.96 (per 100,000 inhabitants) in 2001 to 3.24 (per 100,000 inhabitants) in 2019. In Mato Grosso, the rates were 2.77 (per 100,000 inhabitants) and 3 (per 100,000 inhabitants) in the same years. The highest value was found in 2004 (3.81/100,000 inhabitants), and the lowest in 2006 (2.11/100,000 inhabitants). For lymphomas, the rates ranged from 1.91 (per 100,000) in 2001 to 2.01 (per 100,000 inhabitants) in 2019 in Brazil, while in Mato Grosso it ranged from 1.73 to 2.05 (per 100,000 inhabitants), the highest value in the series. The lowest value was found in 2004 (0.85/10,000 inhabitants).

Table 1. Deaths from leukemias (n=1,468) and lymphomas (n=724) according to sociodemographic variables, Mato Grosso, Brazil, 2001 to 2019*.

		Leukemias		Lymphomas	
		n	%	n	%
Sex	Male	792	54	452	62.4
	Female	676	46	272	37.6
Race/skin color	Yellow	9	0.6	3	0.4
	White	602	42.5	304	43
	Indigenous	11	0.8	5	0.7
	Brown	734	51.8	354	50.1
	Black	62	4.4	41	5.8
Educational level (years)	None	217	17	94	14.4
	1 to 3	316	24.7	177	27.2
	4 to 7	335	26.2	172	26.4
	8 to 11 years	307	24	140	21.5
	12 years and over	104	8.1	68	10.4
Marital status	Single	473	36.1	174	25.5
	Married	538	41.1	347	50.8
	Other	44	3.4	26	3.8
	Judicially separated	65	5	37	5.4
	Widow(er)	190	14.5	99	14.5
Age range (years)	<19	302	20.6	60	8.3
	20-29	139	9.5	41	5.7
	30-39	142	9.7	49	6.8
	40-49	129	8.8	78	10.8
	50-59	191	13	124	17.1
	60-69	203	13.8	163	22.5
	70-79	206	14	151	20.9
	80 and older	156	10.6	58	8.0

Source: Mortality Information System (SIM). *For variables race/skin color, educational level and marital status, totals differ from the others due to lack of information.

The temporal trend analysis showed that, in Brazil, leukemia mortality rates were stable (APC=0.2; 95%CI 0.0–0.3) considering the entire period analyzed. When stratified by age group, a downward trend was observed among the youngest from 2010 to 2019 (APC=-1.3;

95%CI -2.4–-0.2) and the aged between 20 and 59 years from 2001 to 2019 (APC=-0.5; 95%CI -0.8–-0.3). Among the aged 60 years and over, the rates had an upward trend, especially between 2014 and 2019 (APC= 3.3; 95%CI 1.6–5.0). For Mato Grosso, there were no oscillations in leukemia mortality rates, which remained stable throughout the period (APC=0.3; 95%CI 1.0–1.6) even after stratification by age group (Table 2).

Lymphoma mortality rates in Brazil were also stable from 2001 to 2019 (APC=0.2; 95%CI -0.4–0.1). When checked for different age groups, there was a significant reduction among people under 20 years old, particularly between 2014 and 2019 (APC=-5.3; 95%CI

Table 2. Leukemia mortality trends, Mato Grosso and Brazil, 2001 to 2019.

	Mato Grosso				
	Time frame	APC	95%CI	AAPC	95%CI
	2001–2019	-0.2	(-0.4–0.1)	-0.2	(-0.4–0.1)
0-19 years					
Trend 1	2001–2003	64.0	(-49.8–435.9)	3.1	(-10.7–19.1)
Trend 2	2003–2006	-16.1	(-51.8–46.1)		
Trend 3	2006–2019	0.7	(-1.4–2.8)		
20-59 years					
Trend 1	2001–2019	0.1	(-1.8–2.0)	0.1	(-1.8–2.0)
>60 years					
Trend 1	2001–2019	0.3	(-1.3–2.0)	0.3	(-1.3–2.0)
	Brazil				
	Time frame	APC	95%CI	AAPC	95%CI
	2001–2019	0.2	(-0.0–0.3)	0.2	(-0.0–0.3)
0-19 years					
Trend 1	2001–2010	0.7	(-0.4–1.8)	-0.3	(-1.0–0.4)
Trend 2	2010–2019	-1.3*	(-2.4–-0.2)		
20-59 years					
Trend 1	2001–2019	-0.5*	(-0.8–-0.3)	-0.5*	(-0.8–-0.3)
>60 years					
Trend 1	2001–2005	2.0	(-0.3–4.4)	1.4*	(0.7–2.2)
Trend 2	2005–2014	0.2	(-0.6–1.0)		
Trend 3	2014–2019	3.3*	(1.6–5.0)		

APC: annual percent change; AAPC: average annual percent change; 95%CI: 95% confidence interval; *p<0.05.

-9.7–-0.8), and between 20 and 59 years old (APC=-0.5; 95%CI -0.8–-0.2). An upward trend was seen among the aged 60 years and over (APC=0.5; 95%CI 0.2–0.7). In Mato Grosso, differently from what was observed for the whole country, mortality from lymphomas was increasing (APC=2.3; 95%CI 0.5–4.2). No statistically significant oscillations were found in the analysis by age group (Table 3).

In Brazil, between 2001 and 2019, more than 2.2 million PYLL due to leukemias was established, with a rate of 64 PYLL per 100,000 inhabitants; for lymphomas, approximately 923,000 PYLL, with a rate of 27 years per 100,000 inhabitants. Of this total, the state of Mato Grosso accounted for 1.6% of PYLL for leukemias and 1.3% for lymphomas. For both conditions, males had higher PYLL rates, and, when comparing age groups, higher proportions of PYLL due to leukemias were found in individuals between 20 and 29 years old (17.6%) and, due to lymphomas, among the aged 40 to 49 years (16.6%). Higher rates were found among the aged 5 to 9 years (87/100,000 inhabitants) and 50 to 59 years (38/100,000 inhabitants), in that order, similarly to PYLL rates from Brazil (Tables 4 and 5).

Table 3. Lymphoma mortality trends, Mato Grosso and Brazil, 2001 to 2019.

	Mato Grosso				
	Years	APC	95%CI	AAPC	95%CI
	2001–2019	2.3*	(0.5–4.2)	2.3*	(0.5–4.2)
0-19 years					
Trend 1	2001–2019	-0.5	(-5.9–5.1)	-0.5	(-5.9–5.1)
20-59 years					
Trend 1	2001–2019	0.8	(-1.7–3.4)	0.8	(-1.7–3.4)
>60 years					
Trend 1	2001–2019	2.6	(-0.2–5.5)	2.6	(-0.2–5.5)
	Brazil				
	Years	APC	95%CI	AAPC	95%CI
	2001–2019	0.3	(-1.0–1.6)	0.3	(-1.0–1.6)
0-19 years					
Trend 1	2001–2014	-0.9*	(-1.6–-0.3)	-2.2*	(-3.4–-0.9)
Trend 2	2014–2019	-5.3*	(-9.7–-0.8)		
20-59 years					
Trend 1	2001–2019	-0.5*	(-0.8–-0.2)	-0.5*	(-0.8–-0.2)
>60 years					
Trend 1	2001–2019	0.5*	(0.2–0.7)	0.5*	(0.2–0.7)

APC: annual percent change; AAPC: average annual percent change; 95%CI: 95% confidence interval; *p<0.05.

Table 4. Average number of years, proportion and rate of potential years of life lost due to leukemia by age group per 100,000 inhabitants, Mato Grosso and Brazil, 2001 to 2019.

Age range (years)	Leukemias										
	Males			Females			Mato Grosso Total			Brazil Total	
	PYLL	%	RPYLL	PYLL	%	RPYLL	PYLL	%	RPYLL	PYLL	RPYLL
1–4	2,278	11.7	11.1	2,345	14.5	11.9	4,623	13	11.5	237,783	10
5–9	2,375	12.2	89	2,125	13.2	84	4,500	12.7	87	264,937.50	84
10–14	2,357.5	12.2	87	1,725	10.7	66	4,082.5	11.5	77	250,297.50	77
15–19	2,572.5	13.3	94	1,417.5	8.8	55	3,990	11.2	75	263,760	80
20–29	3,690	19	68	2,565	15.9	50	6,255	17.6	59	374,085	58
30–39	2,590	13.4	54	2,380	14.7	53	4,970	14	53	289,485	50
40–49	1,450	7.5	38	1,775	11	50	3,225	9.1	44	242,250	52
50–59	1,500	7.7	59	1,365	8.5	58	2,865	8.1	59	196,815	57
60–69	575	3	42	440	2.7	34	1,015	2.9	38	89,790	42
Total	19,388	100	69	16,137.5	100	61	35,525.5	100	65	2,209,203	64

PYLL: potential years of life lost; RPYLL: rate of potential years of life lost per 100,000 inhabitants.

Table 5. Average number of years, proportion and rate of potential years of life lost due to lymphomas according to age group per 100,000 inhabitants, Mato Grosso and Brazil, 2001 to 2019.

Age range (years)	Lymphomas										
	Males			Females			Mato Grosso Total			Brazil Total	
	PYLL	%	RPYLL	PYLL	%	RPYLL	PYLL	%	RPYLL	PYLL	RPYLL
1–4	603	7.6	29	201	5.2	10	804	6.8	20	36,046	15
5–9	625	7.9	24	312.5	8.1	12	937.5	8	18	44,187.50	14
10–14	747.5	9.4	28	402.5	10.5	16	1.150	9.8	22	46,402.50	14
15–19	577.5	7.3	21	105	2.7	40	682.5	5.8	13	67,672.50	21
20–29	1.215	15.3	22	630	16.4	12	1.845	15.7	17	154,260	24
30–39	1.295	16.4	27	420	10.9	90	1.715	14.6	18	156,695	27
40–49	1.125	14.2	30	825	21.5	23	1.950	16.6	27	171,500	37
50–59	1.200	15.2	47	660	17.2	28	1.860	15.8	38	168,030	49
60–69	530	6.7	38	285	7.4	22	815	6.9	31	78,005	37
Total	7.918	100	28	3.841	100	14	11.759	100	22	922,798.5	27

PYLL: potential years of life lost; RPYLL: rate of potential years of life.

DISCUSSION

The present study identified that, in Mato Grosso, the highest proportions of deaths from leukemias and lymphomas were among the male population, in people of mixed race / skin color and among those who reported being married. The main difference is related to age, with predominance of leukemias among people under 19 years of age and of lymphomas among people over 60 years of age. Similar results were found in studies carried out by Saraiva et al.[21] and Boccolini et al.[22], but in different time frame analyses.

Age and sex can be identified as factors that influence mortality patterns, since adolescents and young adults have better survival rates after diagnosis and treatment[23,24]. In addition, exposure to risk factors attributable to infections and smoking may influence higher mortality in men than in women[25-27].

In the present study, a stable trend was observed in the overall rates of leukemia in Brazil and in Mato Grosso, both of three per 100,000 inhabitants in the period. A possible explanation for these results is that therapeutic advances, as well as in chemotherapeutic pharmacological therapies, prevented the growth of mortality rates, considering that changes in the handling of cases and treatment for leukemias can be hypotheses for the reduction and maintenance of these rates[28].

On the other hand, the overall mortality rate from lymphomas increased for the state of Mato Grosso. In Brazil, this trend was stable, decreasing only for the age groups below 60 years. The factors pointed out for this increase in the number of deaths in Mato Grosso may be linked mainly to exposure to pesticides, ionizing radiation, benzene and other hydrocarbons, and to some types of viral infections, in addition to aging and lifestyle habits[29] common to the population of the rest of the country.

The cut by age group in this work showed discrepancies in mortality rates according to age. The downward trend seen among younger people in Brazil, both from lymphoma and leukemia, is in line with international studies that showed a downward trend in the Americas[30,31] and Europe[32]. By the same token, Gouveia et al.[7], in a study on factors associated with mortality from leukemia and lymphoma in Brazil, found a greater increase in the risk of death associated with age in patients with lymphomas.

On the other hand, differences between age groups were not seen in the results for Mato Grosso. Balmant et al.[33] noticed a small decline in mortality rates from lymphomas among adolescents and young adults, but only in the South and Southeast regions; in the North and Northeast regions, there was a significant increase trend for both lymphomas and leukemias. Similarly, Gouveia et al.[7] showed higher death rates from leukemias and lymphomas in the South and Southeast regions compared to the others. It is noteworthy that, despite improvements in treatment and access to early diagnosis, these findings might reflect regional inequalities and barriers to timely diagnosis and treatment.

Mato Grosso has agricultural production as economic base and is known to be the largest consumer of chemical fertilizers and pesticides in Brazil. This contributes not only to

exposure, but also to illness and mortality from chronic diseases[11,12] such as hematological cancers. Furthermore, its geographic distribution presents important differences in installed capacity and less availability of primary care, specialized care and outpatient care establishments of medium and high complexity[34].

Regarding PYLL for lymphomas, males had twice the rate when compared to females. Furthermore, PYLL rates were lower for the state compared to Brazil. In the case of leukemias, state and national rates of PYLL were similar, 64 and 65, respectively, with a higher proportion among younger people.

It is important to analyze PYLL estimates and assess the impact of cancer mortality rates among younger age groups, even if they do not occur frequently. Song et al.[35], in a study on the burden of PYLL from cancer in the United States of America, in 2017, showed that the highest mortality occurred at older ages, resulting in lower PYLL; but rare cancers such as leukemias were shown to be reflected in the increase in the PYLL rate, although they do not contribute much to overall cancer mortality.

According to the Pan American Health Organization report that analyzed the burden of chronic noncommunicable diseases in the Americas, in 2019, cancer was responsible for 31 million PYLL, equivalent to 3,072 years per 100,000 inhabitants, with an increase from 25.2 million years in 2000 to 31.1 million years in 2019. Among the main neoplasms that affect PYLL, leukemias and lymphomas are in fourth and fifth positions, respectively. This draws attention to the severity of the disease and to a set of actions and interventions that should be prioritized to reduce premature mortality[36].

A study carried out by Wünsch Filho et al.[37] identified that, in Brazil, differences in mortality are related to data reliability, survival time, and socioeconomic conditions. From this perspective, studies have highlighted some problems that interfere with the accuracy of mortality statistics, such as poor completion of death certificates and the challenge of investigating deaths from ill-defined causes, which, despite difficulties in implementation, have contributed to an important reduction in the percentage of such records[38,39].

The use of secondary data may be a limitation of epidemiological studies, as they refer to administrative records in public domain that may contain underreporting. However, this limitation does not prevent reliance or use.

It is noteworthy that the quality of information on SIM has progressively evolved. An evaluation carried out by the Ministry of Health from 2000 to 2016 showed coverage of above 95% for both sexes in the state of Mato Grosso and a slight improvement in the level of proportion of deaths classified with the Garbage code (above 15% in 2000 for percentages between 10, and 15% in 2016). In the general quality index of mortality data, the state went from an average quality index (between 50 and 69%) in the year 2000 to a high level of quality (between 70 and 84%) in 2016[40].

The importance of strengthening the structuring of cancer surveillance is highlighted, by means of records for monitoring, disease control, case closure and death registration, especially in the less developed regions of Brazil and Mato Grosso, where gaps care are a reality and can interfere with the quality of access to information about cancer.

Therefore, articulating databases of population-based cancer registry, hospital cancer registry and mortality system is extremely important to subsidize information on the incidence and prevalence of cancer and mortality so as to reduce the chances of incompleteness or low reliability of information[41].

On the other hand, the literature lacks publications on PYLL for cancers in general, especially for leukemias and lymphomas at state and national levels, addressing the characterization of this profile by sex and age group. This leads us to consider the uniqueness of this article and the need to continue the analysis in the coming years, which will provide us a broader picture of the impact of cancer burden and the high mortality rates.

The high average number of years lost illustrates the poor prognosis of the disease compared to developed countries. Early diagnosis and appropriate and timely treatments are essential to change this situation, as well as to reduce socioeconomic inequities, increasing survival of individuals affected by this serious morbidity.

ACKNOWLEDGMENTS

We thank the Institute for Collective Health of Universidade Federal de Mato Grosso; the Coordination for the Improvement of Higher Education Personnel (CAPES), for the master's scholarships; the Mato Grosso State Health Department and the Public Labor Ministry of the 23rd Region, for the financial support for this project; and to the National Cancer Institute José Alencar Gomes da Silva (INCA), for contributing to the training of cancer registrars.

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Received on: 08/20/2021
Reviewed on: 03/13/2022
Accepted on: 03/14/2022
Preprint: 04/19/2022
https://preprints.scielo.org/index.php/scielo/preprint/view/3980

Authors' contributions: Soares, M.R.: conceptualization, data curation, writing – review & editing, methodology. Melanda, F.N.: conceptualization, data curation, writing – review & editing. Lima Neto, G.S.: writing – review & editing, methodology. Takagi, V.T.: data curation, writing – review & editing. Anjos, A.A.S writing – review & editing, investigation. Cunha, L.A.D.: writing – review & editing, methodology. Silva, G.P.: formal analysis, data curation. Santos, B.C.: formal analysis, writing – review & editing. Souza, P.C.F.: formal analysis, conceptualization, writing – review & editing, methodology. Corrêa, M.L.M.: formal analysis, writing – review & editing, methodology.